REMARKS

Applicant appreciates the continued thorough examination of the present application that is reflected in the Official Action of May 14, 2007 (the "Official Action").

1. The Objections to the Drawings Have Been Overcome

The Official Action objects to the drawings under 37 CFR 1.83(a). In particular, the Official Action states that the drawings must show every feature of the invention specified in the claims. With respect to a micro mask between the mask layer and the substrate, Applicant has amended Figures 9 and 10 as shown in the Replacement Sheet included herewith to show the micro mask 315 between the mask 310 and the substrate 100. Support for this amendment is found, for example, at page 15, lines 16-20 of the specification. No new matter has been added

2. The Claim Rejections Have Been Overcome

Claim 1 stands rejected under 35 USC 102(b) as anticipated by U.S. Patent No. 5,779,224 to Krames et al. ("Krames"). Applicant has amended Claim 1 to include the recitations of now-cancelled Claim 17. In particular, Claim 1 has been amended to recite "etching the semiconductor layer using the patterned mask layer to define the three dimensional geometric patterns, wherein a plurality of geometric patterns are generated in the surface of the semiconductor layer, the plurality of geometric patterns including a plurality of different geometric patterns."

Claim 17 stands rejected as obvious over Krames. In rejecting Claim 17, The Official Action states that forming different three dimensional geometric patterns in a substrate is a mere design choice "and the difference in the shape of the structure does not make the device operating differently (sic)." Official Action, page 6. As explained in the present specification, the three dimensional features may assist in the extraction of light from the chip. Since similar three dimensional features would tend to redirect light in similar patterns, providing different three dimensional features in a chip may help to change the direction of light emitted by the chip so as to provide a desired emission pattern, such as a more uniform emission pattern. Thus, contrary to

the Examiner's assertion, providing different three dimensional features in a chip does in fact make the device operate differently by providing a more random emission pattern.

Krames teaches away from formation of different geometric structures in a surface of a light emitting diode. In the Background section of Krames, Krames distinguishes random texturing of substrates as follows:

> Another prior art approach is random texturing or roughening of the surfaces of the semiconductor LED, as shown in FIG. 1 and taught by Schnitzer, et al in Applied Physics Letters 63, 2174 (1993). A random surface texture randomizes the angular distribution of light rays within the device. This randomization increases the overall probability that light will enter an escape cone after many multiple passes through the device structure. Light emitted from the active region strikes the top surface many times before entering an escape cone. In Applied Physics Letters 62, 131 (1993), Schnitzer, et al. noted that very high total external quantum efficiencies (>72%) could be realized in optically pumped structures by the extraction of multiple-pass light. In this case, careful attention was made to minimize absorption within the device. In a practical, electrically pumped device, lossy or absorptive regions within the device (e.g., absorbing substrate, active layer, defects, doped regions, etc.) or at its extremities (e.g., metal contacts, die-attach epoxy, etc.) significantly reduce the intensity of multiple-pass light rays and thus limit the extraction efficiency gains. Thus, multiple-pass light extraction techniques provide only a modest improvement since in practical devices photons are not allowed many passes through the device before being absorbed.

In contrast, Krames teaches the formation of the same geometric patterns in the surface of a light emitting diode for enhanced light extraction. See, e.g., Krames Figure 4 and accompanying text ("FIG. 4 shows an LED with an ordered textured top surface." Krames, col. 4, lines 54-55). In fact, each embodiment illustrated in Krames shows a device with an "ordered textured" surface including repeated formations of the same geometric features. See, e.g., Krames, Figures 8-14.

The Official Action states that the present specification "does not describe different geometric patterns as essential or critical or the only shape that could operate the claimed invention." Official Action, page 6. Applicant is unaware of any authority that requires every recitation of a claim, including novel recitations, to be "essential" or "critical" to the operation of an invention. Applicant has demonstrated

that the recitations in question are useful, novel and nonobvious, and accordingly, submits that Claim 1 is patentable over Krames.

Moreover, Applicant disagrees with the statement at page 2 of the Official Action that Krames teaches using UV radiation to remove mask material as recited in Claim 1. Krames describes the use of UV radiation as follows:

> An electro-or photo-sensitive thin film (5) is applied to the top of the device (FIG. 7a). This film is exposed using electron-beam lithography, laser beam interference, or UV radiation, etc., and the desired pattern is developed (6) (FIG. 7b).

Krames, col. 7, lines 12-14. Thus, UV radiation is used to expose a film, which is subsequently developed. As is well known to those skilled in semiconductor photolithography, exposure of a film changes the chemical properties of the film, but does not remove the film. Rather, the film is removed by a developer, which uses the changed chemical properties of the film to selectively remove the exposed (or unexposed) portions of the film. Thus, Krames does not teach or suggest "applying laser light to the mask layer at an energy sufficient to remove material from the mask layer" as recited in Claim 1.

For at least these reasons, Applicant respectfully requests that the rejection of Claim 1 be withdrawn.

Dependent Claims 4-6, 12, 13, 21, 23 and 25-27 are patentable at least per the patentability of Claim 1.

In addition, Applicant notes that Claim 21 recites "wherein the geometric patterns comprise randomization features formed in the semiconductor layer." As noted above, Krames expressly teaches away from randomization features in favor of ordered features for light extraction. Accordingly, Applicant respectfully submits that Claim 21 defines patentable subject matter for at least these additional reasons.

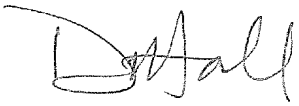
Claims 46, 48-52 and 53 stand rejected as unpatentable over Krames in view of EP 1263058 to Suehiro et al. ("Suehiro") and U.S. Publication No. 2007/0080365 to Watanabe. Claim 46 has been amended to include recitations of now-cancelled Claim 52, namely, that the three dimensional geometric patterns comprise a plurality of different geometric patterns. Accordingly, Claim 46 is submitted to be patentable for similar reasons as Claim 1, which will not be repeated for brevity.

CONCLUSION

Applicant appreciates the continued thorough examination of the present application. Applicant respectfully submits, however, that the claims are neither anticipated by nor obvious in view of the cited reference(s). Accordingly, Applicant respectfully requests withdrawal of the outstanding rejections and allowance of the present application.

The Examiner is encouraged to contact the undersigned attorney by telephone should any additional issues need to be addressed.

Respectfully submitted,



David C. Hall
Registration No. 38,904

Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401
Customer No. 20792